The Use of Airborne Electromagnetic Surveys as an Exploration Tool for Uranium Deposits in the Nebraska Panhandle

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Electromagnetic methods have rarely been used in the exploration for sandstone uranium deposits. However, airborne electromagnetic IAEM] surveys have been successfully used to map aquifers some of which are potential uranium targets. The U.S. Geological Survey and the Nebraska Geological Survey have collected airborne geophysical data as part of an ongoing project to define the hydrogeologic framework of the principal aquifer in the Platte River Valley of the Nebraska Panhandle. Additional interpretation of these data sets has identified areas where deep confined aquifers within White River Group [WRG] sediments may contain economic deposits of uranium.

Economic concentration of uranium occurs as roll-front deposits in the Eocene Chamberlain Pass Formation [CPF] of the WRG in the Crawford, NE area. These roll-fronts formed along the margins of the paleovalleys cut into the underlying Cretaceous compared to the surrounding material. Several different helicopter AEM systems were flown in 2008 and 2009 over a test block near Sidney, NE, to evaluate their relative merits in mapping fluvial sandstone and conglomerate aquifers to depths of 100 m. Two of the time domain AEM systems could map to depths of 300m but the resolution of CPF channels was marginal due to thick electrically conductive materials of the overlying sediments. The distribution of deep channels from the test block and other lines in the area correlates with the mapping of the CPF sands from oil and gas borehole geophysical logs in the area. Fixed wing AEM systems can effectively map down to 500 meters and would allow mapping of the CPF paleovalleys over most of the Nebraska Panhandle.